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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/789,588

02/27/2004

Andrew M. Dattelbaum

S-100,636

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EXAMINER

SODERQUIST, ARLEN

ART UNIT

PAPER NUMBER

1743

DATE MAILED: 10/04/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

**Office Action Summary
for Applications
Under Accelerated Examination**

Application No.

10/789,588

Applicant(s)

DATTELBAUM ET AL.

Examiner

Arlen Soderquist

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Since this application has been granted special status under the accelerated examination program,
NO extensions of time under 37 CFR 1.136(a) will be permitted and a **SHORTENED STATUTORY PERIOD FOR
REPLY IS SET TO EXPIRE:**

ONE MONTH OR THIRTY (30) DAYS, WHICHEVER IS LONGER,
FROM THE MAILING DATE OF THIS COMMUNICATION – if this is a non-final action or a *Quayle* action.
(Examiner: For **FINAL** actions, please use PTOL-326.)

The objective of the accelerated examination program is to complete the examination of an application within twelve months from the filing date of the application. Any reply must be filed electronically via EFS-Web so that the papers will be expeditiously processed and considered. If the reply is not filed electronically via EFS-Web, the final disposition of the application may occur later than twelve months from the filing of the application.

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 3) ☒ Claim(s) 1-17 is/are pending in the application.
3a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 4) ☐ Claim(s) ____ is/are allowed.
- 5) ☒ Claim(s) 1-17 is/are rejected.
- 6) ☐ Claim(s) ____ is/are objected to.
- 7) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 8) ☐ The specification is objected to by the Examiner.
- 9) ☐ The drawing(s) filed on ____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 10) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 11) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. ____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- ☒ Notice of References Cited (PTO-892)
- ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- ☐ Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date ____.
- ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. ____.
- ☐ Notice of Informal Patent Application
- ☐ Other: ____.

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1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.

2. Claims 1, 4-7 and 9-12 are rejected under 35 U.S.C. 102(a) as being anticipated by Xi. In the paper Xi presents spectroscopic studies on conjugated polymers in mesoporous channels. The influence of mesoporous environment on the conjugated polymers was studied by UV-Vis absorption and Photoluminescence spectroscopy (detector). The applied polymers were three novel poly(p-phenylenevinylene) derivatives (DDMA-PPV) shown in figure 1. These polymers have dibenzothiophen-5,5-dioxide units in their backbones, but are different from each other in the length of alkoxy side-chains. The polymers were incorporated into the mesoporous channels of SBA-15 by sorption from their dilute solutions. The confined polymers exhibited different trends in the shifts of the absorption onsets and the emission peaks depending on the length of the side-chains. The polymer with shorter side-chain showed red-shifts in both the absorption and emission spectra, whereas the polymer with longer side-chain showed blue-shifts. These phenomena were caused by the combined influences from the electronic confinement and the conformation distortion. Moreover, these trends were enhanced when the polymers were loaded in amine-modified SBA-15. The synthesis of the mesoporous silica materials is taught in the experimental section and used an amphiphilic block copolymer under acidic conditions.

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.

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4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

4. Claims 1-12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hernandez in view of Zhao. In the paper Hernandez teaches the controlled placement of luminescent polymers in mesostructured sol-gel thin films. Three 1-step methods to design hybrid mesoporous SiO₂ thin films in which the desired molecule is deliberately placed in a specified region of the mesostructure were demonstrated. These methods are improvements on methods that form the mesoporous structure first followed by diffusion of the dopant into empty pores. The 2nd approach utilizes an organic conducting polymer containing sulfonate groups (i.e., water-soluble poly((2,5-methoxypropyloxysulfonate)phenylene vinylene)), which is dissolved in the initial sol, and, as the film is formed, the organic backbone is incorporated in the organic region of the film while the sulfonate groups reside in the ionic interface region. In this process the polymer is added to a solution containing the sol gel forming precursors and the cationic template cetyltrimethylammonium bromide (CTAB, see footnote 31). Figure 2 and its associated discussion teach the detection of polarized fluorescence from the material. Hernandez does not teach the use of a non-cationic surfactant in the formation of the mesoporous structure.

In the paper Zhao teaches a family of highly ordered mesoporous (20-300 Å) silica structures synthesized by the use of commercially available nonionic alkyl poly(ethylene oxide) (PEO) oligomeric surfactants and poly(alkylene oxide) block copolymers in acid media. Periodic arrangements of mesoscopically ordered pores with cubic Imm, cubic Pmm (or others), 3-d hexagonal (P6₃/mmc), 2-d hexagonal (p6mm), and lamellar (L) symmetries have been prepared. Under acidic conditions at room temperature, the nonionic oligomeric surfactants frequently form cubic or 3-d hexagonal mesoporous silica structures, while the nonionic triblock copolymers tend to form hexagonal (p6mm) mesoporous silica structures. Hexagonal mesoporous silica structures with d(100) spacings of 64-77 Å can be synthesized at 100 C by using oligomeric nonionic surfactants. Highly ordered hexagonal mesoporous silica structures (SBA-15) with unusually large d(100) spacings of 104-320 Å have been synthesized in the presence of triblock poly(ethylene oxide)-poly(propylene oxide)-poly(ethylene oxide) (PEO-PPO-PEO) copolymers. The EO/PO ratio of the copolymers can be used to control the formation of the silica mesophase: lowering this ratio of the triblock copolymer moieties promotes the

formation of lamellar mesostructured silica, while higher ratios favor cubic mesostructured silica. The assembly of the inorganic and organic periodic composite materials appears to take place by a hydrogen bonding ($\text{Si-OH}^+(\text{X-I}^-)$) pathway. Page 6025 teaches that the overall strategy of using block copolymers in materials synthesis is applicable not only to composites containing hydrophilic-hydrophobic copolymers, such as the silica-poly(alkylene oxide) system, but more generally to any self-assembling surfactant or copolymer system in which a network-forming additive is selectively partitioned among different mesostructured components. An enormous variety of nanophase-separated composite materials can be envisioned in which variations in the choice of blocks, copolymer compositions, solvents, or chain architecture are used to tune self-assembly, while processing variables such as temperature, pH, aligning fields, etc., are manipulated to regulate fixation of the resultant structure(s). For several reasons, including product cost, environmental, and biomimetic considerations, they sought to use dilute aqueous organic concentrations in silica composite and mesoporous materials syntheses. Built into this has been the idea of cooperative self-assembly of the molecular inorganic and organic species, which together influence the final morphology and mesoscopic ordering obtained and both of which can be controlled kinetically and via inorganic-organic interface interactions. Balanced Coulombic, hydrogen bonding, and van der Waals interactions with charge matching in aqueous syntheses provide an effective means of enhancing long-range periodic order. Such interactions are particularly important at the inorganic-organic interface and can be realized by working with cationic silica species below the aqueous isoelectric point of silica (pH \sim 2). With cationic surfactants and syntheses carried out in HCl media below the aqueous isoelectric point of silica, the key interactions are among the cationic surfactant, chloride anion, and the cationic silica species (designated as $\text{S}^+\text{X-I}^+$, where S^+ is the cationic surfactant, X^- is the halide anion, and I^+ is a protonated Si-OH moiety, i.e., $[\text{Si}]^+$, and the overall charge balance is provided by association with an additional halide anion). Solubilization of nonionic poly(alkylene oxide) surfactants and block copolymers in aqueous media is due to the association of water molecules with the alkylene oxide moieties through hydrogen bonding. This should be enhanced in acid media where hydronium ions, instead of water molecules, are associated with the alkylene oxygen atoms, thus adding long-range Coulombic interactions to the coassembly process. If carried out below the aqueous isoelectric point of silica, cationic silica species will be present as

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precursors, and the assembly might be expected to proceed through an intermediate of the form $(\text{SiOH}^+)(\text{X-I}^-)$. The anion may be coordinated directly to the silicon atom through expansion of the silicon atom's coordination sphere. The goal was to use this structure-directing route to create highly ordered structures with low-cost, nontoxic, and biodegradable nonionic organics under relatively dilute aqueous conditions. In particular, we chose to investigate the use of block copolymers in order to extend the range and control of inorganic-organic mesophase structures from nanometer to larger length scales.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to use a non-ionic block copolymer in the Hernandez process of forming the mesoporous materials because of the advantages related to ability to tune the structure based on the surfactant structure, cost of the materials and the similarity to the process used in forming the structure using cationic surfactants in an acidic environment as taught by Zhao.

5. Claims 13-17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hernandez in view of Zhao as applied to claim 1-12 above, and further in view of Chen. Hernandez does not teach the use of the materials to sense nitroaromatics.

In the paper Chen discusses the application of poly((2,5-methoxypropyloxysulfonate)phenylene vinylene) for chemical sensing. Both the photophysics and the fluorescence quenching behavior of the anionic conjugated polymer towards various small molecule quenchers can be modulated effectively by complexing the polymer with a simple counter-charged detergent. For example upon adding dodecyltrimethylammonium bromide (DTA) to the polymer, cationic quenchers such as Me viologen become less effective while the quenching by neutral reagents - most notably nitroaromatics or cyanoaromatics - is enhanced. Page 28 teaches that the enhancement is due to the hydrophobic environment created by the surfactant around the polymer acting to chaperone the nitroaromatics into association with the polymer. Thus, the polymer-detergent complex provides a new platform for sensing chemical agents via fluorescence quenching. Thin films formed from the complex exhibit high sensitivity to quenching by nitroaromatic vapor (TNT and DNT, figures 3 and 5) and reasonable reversibility.

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It would have been obvious to one of ordinary skill in the art at the time the invention was made to use the Hernandez material as a sensing material for nitroaromatics because of the use of the polymer in the presence of a surfactant as taught by Chen.

6. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. The additionally cited art teaches various things related to mesoporous structures.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Arlen Soderquist whose telephone number is (571) 272-1265. The examiner can normally be reached on Monday-Thursday and Alternate Fridays.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jill Warden can be reached on (571) 272-1267. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.



Arlen Soderquist
Primary Examiner
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